ARTICULATED ASSEMBLY FOR PIPELINES AND A JOINT DEVICE

Inventors: Harald Syse, Royneberg (NO); Jostein Aleksandersen, Randaberg (NO)

Correspondence Address:
GABLE & GOTWALS
100 WEST FIFTH STREET, 10TH FLOOR
TULSA, OK 74103 (US)

Appl. No.: 11/719,633
PCT Filed: Nov. 16, 2005
PCT No.: PCT/NO05/00431
§ 371 (e)(1), (2), (4) Date: Sep. 20, 2007

Foreign Application Priority Data
Nov. 17, 2004 (NO) 2004 5000

Publication Classification
Int. Cl. F16L 27/04 (2006.01)
U.S. Cl. .......................................................... 285/263

ABSTRACT

An articulated assembly 1 for insertion into pipelines, the articulated assembly 1 comprising four modules 2 being connected together by respective joint devices 4, and a operating system including transfer means 4, and a operatin
ARTICULATED ASSEMBLY FOR PIPELINES AND A JOINT DEVICE

[0011] The invention relates to an articulated assembly for insertion into pipelines and a joint device for an articulated assembly and is concerned particularly, although not exclusively, with an articulated assembly for plugging pipelines and a joint device for an articulated assembly for plugging pipelines.

BACKGROUND OF THE INVENTION

[0002] When maintaining and possibly developing pipelines, such as pipelines for transporting petroleum products, it is often necessary to insert pigging assemblies or plugging assemblies into the pipeline in order to inspect or repair sections of the pipeline or to be able to shut down longer or shorter sections of the piping system.
[0003] Known pigging and plugging assemblies comprise multiple articulated modules connected to each other by joint devices. The joint devices enable the modules to negotiate bends within the pipeline. The articulated modules have an operating system that may comprise many different control lines and operating lines such as electrical cables, hydraulic tubes and control wires.
[0004] We have found that because these lines extend between the modules they are exposed to excessive wear and to potential damage.
[0005] The present invention provides advantages over the known assemblies.

DISCLOSURE OF THE INVENTION

[0006] According to a first aspect of the present invention there is provided an articulated assembly for insertion into pipelines, the articulated assembly comprising a plurality of modules being connected by a respective joint device, and transfer means for a operating system, characterised in that at least one joint device is formed with a opening for providing a communication channel between adjacent modules and through which the transfer means extends.
[0007] The transfer means of the articulated assembly may comprise power cables such as hydraulic lines and electrical lines, as well as control lines, management lines and communication lines, which all form part of the operating system of the articulated assembly.
[0008] The arrangement of the articulated assembly is such that the joint device provides protection for the transfer means of the operating system. The protection is achieved by extending the transfer means through the structure of the joint device. Therefore, the joint device preferably has a dual function of providing articulation means for the modules and protection means for the operating system.
[0009] Preferably, the opening of the joint device extends along the length of the joint device.
[0010] The joint device preferably comprises a tubular section formed with an opening extending between two ends of the tubular section and through which the transfer means extends.
[0011] Preferably, one end of the tubular section forms one part of a first mechanical joint arrangement, a second part of the mechanical joint arrangement being attached to or forming part of a module of the assembly.
[0012] Preferably, the opposite end of the tubular section forms one part of a second mechanical joint arrangement, the second part of the second mechanical joint arrangement being attached to or forming part of a module of the assembly.
[0013] The opening for providing a communication channel between adjacent modules preferably extends through the second parts of the mechanical joint arrangements.
[0014] The mechanical joint arrangements are preferably ball and socket type joints.
[0015] The articulated assembly preferably comprises a plurality of joint devices.
[0016] According to a second aspect of the present invention there is provided a joint device for an articulated assembly for insertion into pipelines, characterised in that the joint device is formed with a opening for providing a communication channel between adjacent modules of the articulated assembly.
[0017] Preferably, the opening extends along the longitudinal length of the joint device.
[0018] The joint device preferably comprises a tubular section formed with the opening for providing a communication channel between adjacent respective modules of the articulated assembly.
[0019] Preferably, one end of the tubular section forms one half of a part mechanical joint arrangement, the second part of the mechanical joint arrangement being attached to a module of the assembly.
[0020] Preferably, the opposite end of the tubular section forms one part of a second mechanical joint arrangement, the second part of the second mechanical joint arrangement being attached to a part of a module of the assembly.
[0021] The opening for providing a communication channel between adjacent modules preferably extends through the second parts of the mechanical joint arrangements.
[0022] The mechanical joint arrangements are preferably ball and socket type joints.
[0023] In an alternative arrangement, the joint device comprises a flexible tubular section, wherein each end of the flexible tubular section is attached to a respective module.
[0024] The tubular section preferably comprises a plurality of splittable sections. The splittable sections provide a convenient arrangement for assembling and disassembling the joint device.
[0025] The tubular section preferably comprises two sections splittable along the longitudinal axis of the tubular section.
[0026] The joint device preferably comprises means for securing the splittable sections together.
[0027] The means for securing the splittable sections together is preferably an annular element.
[0028] Preferably, in an assembled state of the joint device the securing means is located on the mechanical joint elements of the tubular section.
[0029] In an assembled state of the joint device the outermost radius of each mechanical joint element preferably has an outermost radius less than the outermost radius of the portion of the tubular section between the two mechanical joint elements.
[0030] The joint device preferably comprises means for locking the securing means.
[0031] The means for locking the securing means is preferably an annular element receivable within an annular groove formed in the radially outermost surface of the joint device.
According to a third aspect of the present invention there is provided a joint device for an articulated assembly, characterised in that the joint device is formed with an opening for providing a communication channel between adjacent modules of the articulated assembly and through which transfer means of the articulated module is extendable.

The transfer means of the articulated assembly may comprise power cables such as hydraulic lines and electrical lines, as well as control lines, management lines and communication lines, which all form part of an operating system of the articulated assembly.

The arrangement of the articulated assembly is such that the joint device provides protection for the transfer means of the operating system. The protection is achieved by extending the transfer means through the structure of the joint device. Therefore, the joint device has a dual function of providing articulation means for the modules and protection means for the operating system.

The joint device according to the third aspect of the present invention preferably comprises one or more of the preferable features of the joint device according to the second aspect of the present invention.

While there are particular advantages provided by the present invention according to the first and second aspects of the invention, which are directed towards an articulated assembly that is insertable into a pipeline, the present invention may also be utilised for other types of articulated assemblies that comprises transmission means.

BRIEF DESCRIPTION OF THE DRAWINGS

A specific embodiment of the invention will now be described by way of example only with reference to the accompanying drawing, in which:

FIG. 1 is a side elevation of an articulated pigging assembly;

FIG. 2 is a sectional view of a tubular section of a joint device of the articulated pigging assembly of FIG. 1;

FIG. 3 is a side sectional view of the joint device showing the casing in a split configuration; and

FIG. 4 is a side sectional view of the assembled joint device shown in FIG. 3.

DESCRIPTION OF THE SPECIFIC EMBODIMENTS

With reference to the FIGS. 1 to 4, there is shown a joint device comprising four modules being connected together by respective joint devices, and an operating system including transfer means (not shown).

The models may typically comprise features such as a bumper nose 6 disposed at each end of the assembly, an array of roller wheels 8, packing sections 10 and plugging discs 12.

The transfer means of the operating system may comprise power cables such as hydraulic lines and electrical lines as well as control lines, management lines and communication lines, which all form part of the operating system of the articulated assembly.

The arrangement of the articulated assembly is such that the joint devices provide protection for the transfer means. The protection is achieved by extending the transfer means through the structure of the joint devices. Therefore, the joint devices have a dual function of providing articulation means for the modules and protection means for the operating system of the assembly.

With reference to FIGS. 2 to 4, there is shown a joint device comprising a tubular section formed with an opening extending longitudinally through the opening forms a communication channel between adjacent modules. The tubular section comprises two longitudinal half sections that are splittable along a central axis. In the assembled state (see FIG. 2) there is a longitudinal gap between the two sections. The gap extends along the plane of the axis. In an alternative arrangement the joint device does not have the gap and the joint device is a sealed enclosed unit.

At each end of the tubular section there is a ball and socket joint arrangement. The respective ball and socket joint arrangements each comprise a ball and, respectively, sockets and are shown in FIGS. 3 and 4 and respective sockets.

The balls are formed from the end portions of the sections. Each ball is formed with a respective hole extending along the axis. The holes are in communication with and part of the opening. The two outer ends of the balls are each attached to adjacent modules. In an alternative embodiment the balls form part of the respective modules. Disposed on a radial centre surface of each socket there is a securing ring and a locking ring. Each securing ring abuts a respective annular shoulder and the locking rings are formed on each socket. Each locking ring is received by the respective grooves formed in the outermost surface of each socket.

The method of assembling the joint device comprises removing the locking rings and the securing rings from the tubular section (as shown in FIG. 3). With the rings removed the two half sections may be separated radially so increasing the radius of the opening. The balls may then be placed within the sockets (as shown in FIG. 3). The two half sections may be brought back towards each other so that the inner surfaces of the sockets come into contact with the outer surfaces of the balls, forming respective ball and socket joints. The securing rings are abutted onto the respective shoulders and the locking rings are then placed back into the respective grooves such that the securing rings are held in place.

In the assembled state the joint device comprises a communication channel formed by the opening and holes and through which transfer means extend between adjacent modules. The communication channel extends the complete length of the joint device along the axis.

The skilled person shall appreciate that the joint device may comprise only one ball joint arrangement or include other types of joint arrangements such as, but not limited to, universal joint arrangements and hinge joint arrangements on condition that the joint arrangements provide protection for the transmission means.

In a further embodiment of the invention the joint device may comprise a flexible tubular section, wherein each end of the flexible tubular section is attached to a respective module. The flexibility of the tubular section allows the assembly to articulate. Due to the flexibility of the tubular section, the joint device may not require any ball joints.

The joint device is made from a material suitably strong enough to withstand the working stresses experienced...
1. An articulated assembly for insertion into pipelines, the articulated assembly comprising a plurality of modules connected by a respective joint device, and a transfer means for an operating system, wherein at least one joint device is formed with an opening for providing a communication channel between adjacent modules and through which the transfer means extends.

2. An articulated assembly as claimed in claim 1, wherein the opening extends along the length of the joint device.

3. An articulated assembly as claimed in claim 1, wherein the joint device is comprising a tubular section formed with an opening extending between two ends of the tubular section and through which the transfer means extends.

4. An articulated assembly as claimed in claim 15, wherein one end of the tubular section forms one part of a first mechanical joint arrangement, the second part of the mechanical joint arrangement being attached to or forming part of a module of the assembly.

5. An articulated assembly as claimed in claim 16, wherein the opposite end of the tubular section forms one part of a second mechanical joint arrangement, the second part of the second mechanical joint arrangement being attached to or forming part of a module of the assembly.

6. An articulated assembly as claimed in claim 17, wherein the opening for providing a communication channel between adjacent modules extends through the second parts of the mechanical joint arrangements.

7. An articulated assembly as claimed in claim 16, wherein the mechanical joint arrangements are ball and socket type joints.

8. An articulated assembly as claimed in claim 13, wherein the transfer means of the articulated assembly is comprising power lines and control lines.

9. An articulated assembly as claimed in claim 13, further comprising a plurality of joint devices.

10. A joint device for an articulated assembly of modules for insertion into pipelines, the joint device comprising an opening providing a communication channel between adjacent modules of the articulated assembly.

11. A joint device as claimed in claim 22, wherein the opening extends along the longitudinal length of the joint device.

12. A joint device as claimed in claim 22, further comprising a tubular section formed with the opening providing a communication channel between adjacent respective modules of the articulated assembly.

13. A joint device as claimed in claim 24, wherein one end of the tubular section forms one part of a first mechanical joint arrangement, the second part of the mechanical joint arrangement being attached to one of the modules of the assembly.

14. A joint device as claimed in claim 25, wherein the opposite end of the tubular section forms one part of a second mechanical joint arrangement, the second part of the second mechanical joint arrangement being attached to a part of a module of the assembly.

15. A joint device as claimed in claim 26, wherein the opening for providing a communication channel between adjacent modules extends through the second parts of the mechanical joint arrangements.

16. A joint device as claimed in claim 25, wherein the mechanical joint arrangements are ball and socket type joints.

17. A joint device as claimed in claim 24, wherein the tubular section is comprising a plurality of splittable sections for assembling and disassembling the joint device.

18. A joint device as claimed in claim 29, wherein the tubular section is comprising a plurality of sections splittable along a longitudinal axis of the tubular section.

19. A joint device as claimed in claim 30, further comprising a securing means to secure the splittable sections together.

20. A joint device as claimed in claim 31, wherein the securing means is comprising an annular element.

21. A joint device as claimed in claim 32, wherein with the joint device in an assembled state, the securing means is located on the mechanical joint elements of the tubular section.

22. A joint device as claimed in claim 33, wherein with the joint device in an assembled state, an outermost radius of each mechanical joint element is less than the outermost radius of a portion of the tubular section between the two mechanical joint elements.

23. A joint device as claimed in claim 29, further comprising a locking means for the securing means.

24. A joint device as claimed in claim 35, wherein the locking means is comprising an annular element receivable within an annular groove formed in a radially outermost surface of the joint device.

25. A joint device as claimed in claim 22, wherein each end of the flexible tubular section is attached to a respective module.

26. A joint device for an articulated assembly, comprising a plurality of modules, an opening providing a communication channel between adjacent modules and a transfer means extendable through the communication channel.

* * * * *